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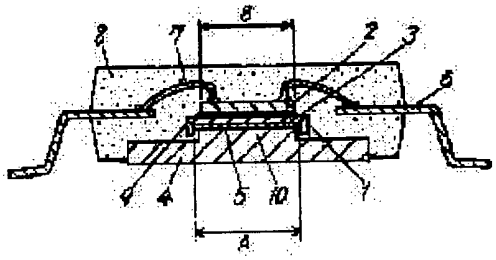
## (54) RESIN-SEALED SEMICONDUCTOR DEVICE AND ITS MANUFACTURE

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent a heat sink from moving outside at the time of resin- sealing.
SOLUTION: A semiconductor chip 2 is bonded on the die pad 1 of a lead frame with silver paste adhesive 3, and a heat sink 4 is bonded between the protruding parts 9 provided at the bottom of the die pad 1 with adhesive 5. Then, the semiconductor chip 2 and the lead 6 of the lead frame are electrically connected by bonding wire 7, and the outer part is sealed by sealing resin 8. This structure permits a layer of the adhesive 5 to receive sealing pressure even in the resin sealing process, and prevents the heat sink 4 from flowing by the sealing resin even when the layer of the adhesive 5 is removed from the die pad 1. Thus, the heat sink 4 is prevented from removing from the bottom of the die pad 1, and resin-sealing is performed at the correct position.

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the plastic-molded-type semiconductor device which contained the heat sink, and its manufacture technique for thermolysis of the heat which occurs from a semiconductor device.
[0002]
[Description of the Prior Art] In recent years, the heat sink pasted the die pad of a leadframe and had pasted up the plastic-molded-type semiconductor device which contained the heat sink, especially the surface mount type semiconductor device as the adhesion technique of the heat sink and the die pad of a leadframe using epoxy resin adhesive.
[0003] The plastic-molded-type semiconductor device which contained the conventional heat sink in below is explained, referring to the cross section of drawing 8 .
[0004] As shown in drawing 8 , the semiconductor chip 2 was joined by the silver paste adhesives 3 on the die pad 1 of a leadframe, and the heat sink 4 pasted up the plastic-molded-type semiconductor device which contained the conventional heat sink with adhesives 5 on the die-pad 1 aforementioned lower part, and the aforementioned semiconductor chip 2 and the external derivation lead 6 of a leadframe were the structures where the bonding wire 7 connected electrically and those enclosures were closed by the closure resin 8. Therefore, adhesion of a die pad 1 and the heat sink 4 was conventionally pasted up and fixed by attaching epoxy resin adhesive 5 to the top of a heat sink 4, and making it heat-harden.
[0005]
[Problem(s) to be Solved by the Invention] However, with the conventional structure, when the die pad and the heat sink were pasted up by epoxy resin adhesive, at a resin-seal process, to a closure pressure, an adhesives layer bears and does not go out, but a heat sink exfoliates from a die pad, it passes with a closure resin, and separating from the die-pad lower part was able to see. Moreover, in order to strengthen adhesive power, when the adhesives which attached adhesives to both sides of a polyimide thin film were used, it became very expensive and the increase in cost was caused on the production. Moreover, although there were also some which pasted up the die pad and the heat sink with solder etc., when the die pad and the heat sink were pasted up with solder, distortion occurred in the die pad with thermal stress, and there was a possibility that a reliability might fall.
[0006] Let it be a technical probrem for this invention to solve such a matter, to position a heat sink in the die-pad lower part certainly by the low cost, and to offer the fixed resin-seal semiconductor device.
[0007]
[Means for Solving the Problem] In order to solve an above-mentioned technical probrem, the plastic-molded-type semiconductor device of this invention has a salient in the circumference lower part of the die pad of a plastic-molded-type semiconductor device, and a heat sink pastes it up between salients of the aforementioned die pad.
[0008] Moreover, in the manufacture technique of the plastic-molded-type semiconductor device of a type of having pasted up the heat sink on the die-pad lower part of a leadframe, in the resin-seal process which is a back process, even if the adhesives on which the aforementioned heat sink is pasted up with the closure pressure exfoliate, the aforementioned heat sink is not passed with a closure resin, but in order to carry out the position readjustment of the heat sink so that the aforementioned heat sink may not separate from the die-pad lower part, it has the process which forms a salient in the die-pad lower part.
[0009] According to this, the resin-seal semiconductor device which positioned the heat sink certainly by the low cost is realizable.
[0010]
[Embodiments of the Invention] With the gestalt of operation of the plastic-molded-type semiconductor device of this invention By having made it the structure pasted up so that a salient might be prepared in the lower part of the periphery of a die pad and the upper part of a heat sink might go into the inside during this salient Even if the glue line which has pasted up the heat sink and the die pad destroys by the pressure at the time of a resin seal and a heat sink exfoliates with a die pad, a heat sink is not passed with a closure resin, and does not shift outside a salient of the lower part around a die pad, and can perform position regulation of a heat sink.
[0011] Moreover, with the gestalt of implementation of the manufacture technique of the plastic-molded-type semiconductor device of this invention, in the manufacture technique of the plastic-molded-type semiconductor device of a type of having

pasted up the heat sink on the die-pad lower part of a leadframe, even if the adhesives on which the aforementioned heat sink has been pasted up with the closure pressure exfoliate in the resin-seal process which is a back process according to the process which forms a salient in the die-pad lower part, the aforementioned heat sink is not passed with a closure resin, but the position readjustment of the heat sink can

[0012] Hereafter, an example of the gestalt of operation of the semiconductor device of this invention is explained, referring to the cross section of drawing 1 .

[0013] As shown in drawing 1 , a heat sink 4 pastes up this plastic-molded-type semiconductor device with adhesives 5 between the salients 9 which a semiconductor chip 2 is joined with the silver paste adhesives 3 on the die pad 1 of a leadframe, and were prepared in the die-pad 1 aforementioned lower part. And a semiconductor chip 2 and the lead 6 of a leadframe are the structures where the bonding wire 7 connected electrically and those enclosures were closed by the closure resin 8.

[0014] In this example, although the bonding wire 7 is used as a means of electrical installation, you may use the bump junction which connects lead 6 and the semiconductor chip 2 through a bump. Moreover, it is needless to say that this example can apply this invention to the semiconductor device of the type with which the heat sink 4 was built in in the closure resin 8 although the inferior surface of tongue of a heat sink 4 is the plastic-molded-type semiconductor device of the type exposed from the 8th page of a closure resin.

[0015] Since a heat sink 4 is not passed by the closure resin and a heat sink 4 does not separate from it from the die-pad 1 lower part like this example even if five layers of adhesives receive a closure pressure and five layers of adhesives exfoliate from a die pad 1 also in the resin-seal process which closes an enclosure by the closure resin 8, since the heat sink 4 is pasted up between the salients 9 prepared in the die-pad 1 lower part, the resin seal is carried out where position readjustment is carried out.

[0016] Moreover, when a heat sink 4 expands thermally about the salient 9 prepared in the lower part of a die pad 1 with the heat which occurs at the time of an operation of a semiconductor chip 2, So that a part of heat sink 4 may contact salient 9 according to the thermal expansion, stress may be applied to this salient 9 and a die pad 1 may not deform Spacing A of the salient 9 of a die pad 1 and the salient 9 makes it larger than dimension B of the jointing 10 of the heat sink 4 which is the part pasted up between the salient 9 of the die pad 1 of a heat sink 4, and the salient 9. That is, without a heat sink 4 separating from spacing A of the salient 9 of a die pad 1, and the salient 9, position readjustment could be carried out, it considered as the dimension which can also buffer the influence of thermal expansion, and dimension B of the jointing 10 of a heat sink 4 was more specifically than spacing A of salient 9 and the salient 9 made into the about [ 10-20% ] parvus dimension of spacing A.

[0017] If a concrete example is given, to the periphery neighborhood of the dimension 5mmx5mm die pad 1 of a copper-alloy leadframe, the salient 9 with a length [ of 4mm ] and a width of face of 0.5mm will be formed, the spacing of salient 9 and the salient 9 will be set to 5mmx5mm, and the heat sink 4 with the projected 4.3mmx4.3mm jointing 10 will be pasted up on the die-pad 1 lower part with adhesives 5. Therefore, the jointing 10 of the heat sink 4 pasted up on the die-pad 1 lower part will have the 0.7mm margin with the right-and-left plan. In this status, in a resin-seal process, even if five layers of adhesives receive a closure pressure and adhesives 5 exfoliate, a heat sink 4 does not separate from a die pad 1, without passing with a closure resin. Furthermore, since the jointing 10 has pasted up between the salient 9 of the die-pad 1 lower part, and the salient 9 with 15% of the margin preferably ten to 20% again even when a heat sink 4 expands thermally, a heat sink 4 (jointing 10) does not contact salient 9 according to the thermal expansion, and there is also no deformation of a die pad 1.

[0018] Next, an example of the gestalt of the operation in the manufacture technique of the plastic-molded-type semiconductor device of this invention is explained, referring to drawings 2 -7.

[0019] as first shown in drawing 2 , a die pad 1 and this die pad 1 are supported to copper-alloy leadframe material -- it hangs and lead patterns, such as lead 11 and the lead 6, are formed

[0020] It pierces for pattern formation of a leadframe and the processing method is used, and when the lead pitch is detailed, it is based on technique, such as the etching method. Moreover, to the periphery neighborhood of a die pad 1, the salient field 12 used as salient 9 is formed. In this example, the salient field 12 which becomes on all sides [ of the dimension 5mmx5mm die pad 1 / periphery ] with the salient 9 with a length [ of 4mm ] and a width of face of 0.5mm is formed. In addition, in drawing 2 , the field shown with the dashed line is a field as a die pad.

[0021] Next, as shown in drawing 3 , the salient field 12 formed in the die pad 1 of the leadframe in which patterns, such as a die pad 1 and the lead 6, were formed is bent to the down side with metal mold, and the salient 9 of the die-pad 1 lower part is formed.

[0022] Next, as shown in drawing 4 , the heat sink 4 first processed into the lower part of a die pad 1 with the material of an oxygen free copper is pasted up by epoxy resin adhesive 5 to the leadframe which has a die pad 1 in which the salient 9 was formed. Adhesion of the heat sink 4 by these adhesives 5 is pasted up and fixed by attaching epoxy resin adhesive 5 and heat-hardening to the jointing 10 of the top of a heat sink 4.

[0023] Next, as shown in drawing 5 , a semiconductor chip 2 is pasted up on the top of the die pad 1 of the leadframe which the heat sink 4 pasted up with the silver paste adhesives 3. A junction of a up to [ the die pad 1 of this semiconductor chip 2 ] is performed at a usual die bond process.

[0024] Next, as shown in drawing 6 , the bonding pad (not shown) of the semiconductor chip 2 joined on the die pad 1 and the lead 6 are electrically connected by the bonding wire 7 which is a conductive thin line. In this example, it carries out using

a wire bonder using the metal wire of the diameter of 25 micrometers of ****s. In addition, the bump connection which connects lead 6 and the bonding pad of a semiconductor chip 2 through a bump (salient electrode) is sufficient instead of a bonding wire 7.

[0025] And as shown in drawing 7 , a resin seal is carried out by the transfermold method using the closure resin 8 so that a semiconductor chip 2 and a part of lead 6 may be surrounded. Since the heat sink 4 has pasted up between the salients 9 prepared in the die-pad 1 lower part at this time, even if five layers of adhesives receive a closure pressure and adhesives 5 exfoliate also in the resin-seal process which closes an enclosure by the closure resin 8, a heat sink 4 does not separate from a die pad 1, and position readjustment is carried out so that it may not pass with the closure resin 8. Moreover, after a resin seal bends and processes lead 6 into surface mounts.

[0026] In addition, although the salient 9 of the die-pad 1 lower part was made into the broad salient structure which continued to the die-pad side in this example, width of face is narrowed, and it is made the pectinate discontinuous the die-pad side, and is good as for plurality.

[0027]

[Effect of the Invention] this invention prepares a salient in the periphery bottom of a die pad, and the outstanding heat sink built-in plastic-molded-type semiconductor device which does not make a die pad generate distortion by stress can be realized, without a heat sink carrying out a position gap by pasting up with adhesives at the time of a resin seal so that the upper part of a heat sink may go into the inside during this salient.

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[Translation done.]